REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. AGENCY USE ONLY *(Leave blank)*

2. REPORT DATE
16 MAY 95

3. REPORT TYPE AND DATES COVERED
MONOGRAPH

4. TITLE AND SUBTITLE
ENGINEER FIELD SQUADRON: A NEW ENGINEER ORGANIZATION FOR OPERATIONS OTHER THAN WAR (OOTW)

5. FUNDING NUMBERS

6. AUTHOR(S)
MAJ LOU L. MARICH

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)

10. SPONSORING/MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION/AVAILABILITY STATEMENT
APPROVED FOR PUBLIC RELEASE: UNLIMITED DISTRIBUTION

12b. DISTRIBUTION CODE

13. ABSTRACT *(Maximum 200 words)*

SEE ATTACHED

14. SUBJECT TERMS
A NEW ENGINEER ORGANIZATION FOR OPERATIONS OTHER THAN WAR (OOTW)

15. NUMBER OF PAGES
52

16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED

NSN 7540-01-280-5500

Standard Form 298 (Rev. 2-89)
Prescribed by ANSI Std. Z39-18
298-102

GENERAL INSTRUCTIONS FOR COMPLETING SF 298

The Report Documentation Page (RDP) is used in announcing and cataloging reports. It is important that this information be consistent with the rest of the report, particularly the cover and title page. Instructions for filling in each block of the form follow. It is important to ***stay within the lines*** to meet ***optical scanning requirements***.

Block 1. Agency Use Only *(Leave blank)*.

Block 2. Report Date. Full publication date including day, month, and year, if available (e.g. 1 Jan 88). Must cite at least the year.

Block 3. Type of Report and Dates Covered. State whether report is interim, final, etc. If applicable, enter inclusive report dates (e.g. 10 Jun 87 - 30 Jun 88).

Block 4. Title and Subtitle. A title is taken from the part of the report that provides the most meaningful and complete information. When a report is prepared in more than one volume, repeat the primary title, add volume number, and include subtitle for the specific volume. On classified documents enter the title classification in parentheses.

Block 5. Funding Numbers. To include contract and grant numbers; may include program element number(s), project number(s), task number(s), and work unit number(s). Use the following labels:

C -	Contract	**PR** -	Project
G -	Grant	**TA** -	Task
PE -	Program Element	**WU** -	Work Unit Accession No.

Block 6. Author(s). Name(s) of person(s) responsible for writing the report, performing the research, or credited with the content of the report. If editor or compiler, this should follow the name(s).

Block 7. Performing Organization Name(s) and Address(es). Self-explanatory.

Block 8. Performing Organization Report Number. Enter the unique alphanumeric report number(s) assigned by the organization performing the report.

Block 9. Sponsoring/Monitoring Agency Name(s) and Address(es). Self-explanatory.

Block 10. Sponsoring/Monitoring Agency Report Number. *(If known)*

Block 11. Supplementary Notes. Enter information not included elsewhere such as: Prepared in cooperation with...; Trans. of...; To be published in.... When a report is revised, include a statement whether the new report supersedes or supplements the older report.

Block 12a. Distribution/Availability Statement. Denotes public availability or limitations. Cite any availability to the public. Enter additional limitations or special markings in all capitals (e.g. NOFORN, REL, ITAR).

DOD - See DoDD 5230.24, "Distribution Statements on Technical Documents."
DOE - See authorities.
NASA - See Handbook NHB 2200.2.
NTIS - Leave blank.

Block 12b. Distribution Code.

DOD - Leave blank.
DOE - Enter DOE distribution categories from the Standard Distribution for Unclassified Scientific and Technical Reports.
NASA - Leave blank.
NTIS - Leave blank.

Block 13. Abstract. Include a brief *(Maximum 200 words)* factual summary of the most significant information contained in the report.

Block 14. Subject Terms. Keywords or phrases identifying major subjects in the report.

Block 15. Number of Pages. Enter the total number of pages.

Block 16. Price Code. Enter appropriate price code *(NTIS only)*.

Blocks 17. - 19. Security Classifications. Self-explanatory. Enter U.S. Security Classification in accordance with U.S. Security Regulations (i.e., UNCLASSIFIED). If form contains classified information, stamp classification on the top and bottom of the page.

Block 20. Limitation of Abstract. This block must be completed to assign a limitation to the abstract. Enter either UL (unlimited) or SAR (same as report). An entry in this block is necessary if the abstract is to be limited. If blank, the abstract is assumed to be unlimited.

ENGINEER FIELD SQUADRON:

A NEW ENGINEER ORGANIZATION FOR OPERATIONS OTHER THAN WAR (OOTW)

A Monograph
by

Major Lou L. Marich
Corps of Engineers

School of Advanced Military Studies
United States Army Command and General Staff College
Fort Leavenworth, Kansas

First Term AY 94-95

SCHOOL OF ADVANCED MILITARY STUDIES

MONOGRAPH APPROVAL

Major Lou L. Marich

Title of Monograph: ENGINEER FIELD SQUADRON: A NEW ENGINEER ORGANIZATION FOR OPERATIONS OTHER THAN WAR (OOTW)

Approved by:

Christian B Cowdrey

Lt Col Christian B. Cowdrey, USMC — Monograph Director

for Robert H. Berlin, Ph.D.

COL Gregory Fontenot, MA, MMAS — Director, School of Advanced Military Studies

Philip J. Brookes

Philip J. Brookes, Ph.D. — Director, Graduate Degree Program

Accepted this 20th day of May 1995

Accesion For	
NTIS CRA&I	☑
DTIC TAB	☐
Unannounced	☐
Justification	
By	
Distribution /	
Availability Codes	
Dist	Avail and / or Special
A-1	

ABSTRACT

ENGINEER FIELD SQUADRON: A NEW ENGINEER ORGANIZATION FOR OPERATIONS OTHER THAN WAR (OOTW) by Major Lou L. Marich, U.S. Army, 49 pages

During the closing days of the Cold War, the U.S. Army Corps of Engineers reorganized the combat engineer units in support of the armored and mechanized divisions. The collapse of the Soviet Union and her proxy allies left the U.S. Army increasingly confronted with emphasis on Operations Other Than War (OOTW). This created a dilemma: new types of operations and organizations optimized for the old, Soviet, threat.

This monograph asks the question: Which engineer organization is better suited for OOTW, the U.S. or the British? The organization and capabilities of the two engineer units are analyzed to determine which organization is better suited for OOTW.

Fist, current U.S. Army doctrine is examined, specifically the tenets of army operations and the principles of OOTW. These establish the criteria for units involved in OOTW. Second, three OOTW operations are studied to identify the OOTW requirements placed on engineer units. The case studies: Lebanon, 1958; Dominican Republic, 1965; and Bosnia-Herzegovina, 1982-83; show that versatility is the principal criteria for engineer success in OOTW. Next the U.S. and British engineer organizations are examined—their personnel, equipment, structure, and capabilities. The fourth part of the study compares the combat engineer company and the field squadron using the criteria established by theory and historical examples.

The last section summarizes the results and answers the thesis question. The U.S. divisional combat engineer companies have become too narrowly focused; they have lost much of the versatility and capability for which the engineers are justifiably famous. The Royal Engineer Field Squadron is a better organization for the types of operations the Army is likely to be facing in the future.

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

SECTION I - INTRODUCTION

We will take the form of not just a smaller army, but an army that is leaner, more deployable, more versatile, more lethal, and more effective as a strategic force.

Engineer 2000 White Paper[1]

The collapse of the Soviet Union and its communist satellites has transformed the bipolar world of the Cold War to one of non-alignment. The end of the Cold War was so abrupt and complete that it virtually changed every aspect of the international order which had prevailed for almost fifty years. In a speech at Aspen, Colorado in August 1990, President George Bush clearly acknowledged the transformation and argued forcefully that "in the post-Cold War World there were a number of threats to U.S. national security that had little or nothing to do with earlier patterns of U.S-Soviet relations."[2]

The lower probability of a high-intensity conflict in Europe has changed the strategic focus of the U.S. Army. Specifically, the Army is transforming itself from a forward deployed army to a power projection army. Operations Other Than War (OOTW) against ill-defined opponents, under uncertain conditions, and on unfamiliar terrain, are seen as the norm for the future.

The end of the Soviet threat and the emergence of the much less concrete "OOTW" mission has resulted in an

increasing reluctance to spend resources on national defense in both Great Britain and the U.S.. Put differently, the disintegration of the Soviet empire has led many in the two countries to expect a "peace dividend": if only we could reduce spending on the defense programs, we could use this cornucopia of extra dollars to solve our many domestic problems.[3]

In his Aspen remarks, President Bush also discussed how the end of the Cold War had changed America's strategic focus. He spoke of "peacetime engagement, of an America remaining involved with the world and committed to democratic principles, and of international security and stability. He challenged the nation to shape its defense capabilities to the changing circumstances of this post-Cold War era."[4] This has left the armed forces trying to redefine their relevant contributions to our nation's force structure.

Because of the dramatic changes which have occurred in the last seven years, the U.S. armed services perceive their resourcing at risk, and all seek relevance and the continued funding which accompanies it. The Army's response has been to examine its structure and functions in an effort to maximize their effectiveness and capabilities, while at the same time reducing their operating costs. These somewhat contradictory goals are driven not only by the need to downsize, but also by the need to make organizations

more effective—to highlight the Army's contribution as "relevant" during a period of increased operational tempo and decreasing resources. This turbulent period in history has affected not only the American, but the British forces as well. Like its counterparts across the Atlantic, the British Army has also gone through a dramatic restructuring. Since the 1990-91 Gulf War, the British Army has reduced its size by amalgamating regiments, forming new corps organizations, and reorganizing many of the existing units.[5]

From 1991 to 1993, in the midst of this restructuring, I was assigned to the U.S. Army Personnel Exchange Program (PEP) as the Operations and Training Officer, 35 Royal Engineer Regiment, British Army of the Rhine (BAOR).[6] In that capacity, I was a witness to the British approach to restructuring for the uncertain future of the post Cold War environment.

During my tour of duty with the British, I observed, planned for, and participated in numerous deployments. These ranged in size from an individual soldier to field section, troop, squadron, and regimental level operations. Many of these missions were in support of OOTW such as community construction projects, peacekeeping, and nation building. These OOTW missions took place in Cambodia, Sub-Saharan Africa, the Middle East, Northern Ireland, and Belize. The last operation during my tenure was a regimental deployment

to Bosnia-Herzegovina as part of the United Nations Protection Force (UNPROFOR).[7] It is this last and largest deployment which provides a basis with which to evaluate the capabilities of a Royal Engineer field squadron in the OOTW environment.

Among the most impressive aspects of these deployments was the professionalism and competence with which they were executed. At all levels, they were accomplished with enthusiasm and an attitude of "let's get on with it". And, in stark contrast with our own situation, British officers and soldiers look at OOTW missions as a normal, even central, part of the spectrum of missions a professional army is required to perform. They accept OOTW as part and parcel of the everyday business of a professional western army.[8]

I've served as an engineer with U.S. units for ten years. During my two years with the British regiment, I had numerous opportunities to compare the organizations fielded by both nations. I was left with the belief that the British engineer squadron model is an especially versatile organization, well suited for OOTW operations which the U.S. Army may well face in the future.

If OOTW receives higher prominence in the future, then what is the best engineer organization for OOTW? And, if there is a better organization, how do we measure its effectiveness?

This monograph answers the question: Is there a better engineer organization for OOTW than the current U.S. Army mechanized combat engineer company? The research method includes five steps. First, current U.S. Army OOTW doctrine is examined to provide the critical factors needed to evaluate a unit's suitability for OOTW. Second, three historical cases are used to validate our doctrine and draw additional evaluation criteria for determining an engineer organization's effectiveness in OOTW. Third, both a combat engineer company and a field squadron organization are examined—personnel, equipment, and operational capabilities. Fourth, the capabilities, advantages, and disadvantages of each organization are evaluated using an inductive approach . Finally, the two organizations are compared and contrasted to see which is more suitable for OOTW under current and anticipated operational conditions.

The theories and historical events that have led to the current engineer organization for both armies will receive only cursory discussion. Instead the monograph will focus on the current U.S. Army's divisional combat engineer company Tables of Organization and Equipment (TO&E) and the British Army's Royal Engineer field squadron 'W' Organization for Battle (ORBAT)[9] as the basis for examination and comparison.

The U.S. Army Corps of Engineers has undergone a major organizational change at the divisional level in the last few years. This restructuring created an engineer brigade, with three combat engineer battalions, to provide support to a division, corrected command and control problems, and increased the overall number of engineers supporting a division.

While the Engineer Restructure Initiative (ERI) has greatly improved the combat engineer's effectiveness in support of heavy mechanized division combat operations, the improvement is largely confined to operations in high intensity conflicts. However, unlike the engineer unit structural changes, the ERI's improvements in command and control arrangements are applicable at all levels of conflict—including OOTW. Accordingly, this monograph focuses on the organization and capabilities of a combat engineer company and may therefore be seen as a logical refinement of ERI.

ERI was developed at the height of the Cold War and is therefore a part of the old paradigm. Its genesis was a requirement to deal with the overwhelming Soviet threat by providing effective engineer support to maneuver units. This engineer restructure initiative was originally described as focusing eighty percent on mobility and twenty percent on countermobility, survivability, and sustainment,[10] a focus appropriate to the threat posed by the Soviets at the time. ERI's

effectiveness in high intensity operations was demonstrated during Desert Shield/Storm in 1990-91.[11]

In those high intensity operations executed during the Persian Gulf War, both the U.S. combat engineer company and the British field squadron performed well. However, these performances did not address the different requirements each could face in OOTW.

Contrary to the ERI approach, the British Army restructured its engineer forces with OOTW clearly in mind. The regimental organization was restructured to take advantage of ERI's benefits which the British Army observed firsthand, while preserving the impressive capability inherent in existing engineer field squadron organizations.[12] This is a direct result of their involvement in ongoing OOTW in Northern Ireland, the Falklands, Hong Kong, Belize and elsewhere.[13]

Clearly, any restructuring of a combat engineer company will have a major impact on the engineer force structure in terms of equipment, personnel, etc.. This monograph will not, however, address the ramifications of any proposed changes; such analysis is beyond the scope of this monograph. Based on my experiences with, and observations of, both the U.S. and British organizations, there is a substantial difference in each unit's ability to support OOTW. Accordingly, this monograph will focus the discussion on their comparative suitability in the emerging OOTW environment.

As a final framing comment, this paper implicitly acknowledges the more extensive U.S. defense responsibilities. Accordingly, it approaches the issue of engineer capabilities to support OOTW within the context of preserving rather than depleting the capability to provide engineer support in a high intensity conflict. Therefore, in order to improve OOTW capabilities while maintaining high intensity capabilities, the U.S. Army Corps of Engineers must have a solid foundation. This foundation is found in our doctrine.

SECTION II - DOCTRINAL REQUIREMENTS

> **The Army's primary mission is to win the nation's wars. The leadership, organization, equipment, discipline, and skills gained in training for war are also of utility to the government in operations other than war.**
>
> **FM 100-5: Operations**[14]

The U.S. Army's current doctrine states that the Army's primary focus is to fight and win the nation's wars.[15] The focus clearly remains on high intensity conflict. The Army does however, recognize that there is a broad spectrum of conflict, and that we have to be able to function throughout this spectrum.

The 1993 version of Army Field Manual (FM)100-5, Operations, makes a marked departure from the previous 1988 version. These changes are the addition of

versatility as a tenet of army operations and the addition of a whole chapter devoted exclusively to OOTW.[16] With these two additions, the Army acknowledges the dramatic changes that have occurred within the last few years and recognizes that the requirements placed on it have changed as well, not just in concept, principle, or requirements, but also in the frequency and magnitude of effort.[17]

Our new doctrine states that OOTW has its own set of principles just like high intensity conflict. The principles for OOTW are: objective, unity of effort, legitimacy, perseverance, restraint, and security. In theory and practice, for a unit to be effective in OOTW, it should be able to balance these principles against specific mission requirements and the nature of the operation. I will therefore look at each of the principles to see how they are relevant to an engineer unit participating in OOTW.

<u>Objective</u>: "Direct every military operation toward a clearly defined, decisive, and obtainable objective.... Each separate operation must be integrated with every other to contribute to the ultimate strategic aim."[18] Since it is very likely that units participating in OOTW will be operating in a non-linear environment, this dictates that the participating units must have the ability to perform missions over extended distances and periods of time. Therefore, the principle of objective

implies that a unit must have a robust command and control, and support structure, and must be able to operate autonomously if required.

Unity of effort: "Seek unity of effort toward every objective."[19] This principle is just as applicable in war as it is in OOTW; yet, it could be much more difficult to achieve in the latter. In OOTW, units may have to deal with other government agencies, international agencies, and allied forces participating in the operation. Military commanders must consider how their actions contribute to initiatives that are also political, economic, and psychological in nature. For OOTW, actions at the lowest level may have the highest strategic consequences. To be able to effectively apply this principle, an organization should have as senior a leadership structure as possible—one that is mature, experienced, and robust enough to deal with the unexpected and complex problems which will confront the deployed unit.

Legitimacy: "Sustain the willing acceptance by the people of the right of the government to govern or of a group or agency to make and carry out decisions."[20] By their actions, units participating in OOTW will reinforce or destroy the legitimacy of an operation. Legitimacy is therefore tied in to all other principles of OOTW.

Perseverance: "Prepare for the measured, protracted application of military capability in support of strategic aims."[21] In OOTW, this protracted application can range from one of force application to one of civic action. It is likely that civic action will be more beneficial in a protracted situation. Units should therefore be able to provide a broad range of capabilities from combat operations to nation assistance.

Restraint: "Apply appropriate military capability prudently."[22] Restraint allows us to conclude that a unit in OOTW has a wide option of responses to a threat. These responses will be governed by Rules of Engagement (ROE). It is then clear that a versatile and flexible unit has a wider number of options from which to choose and execute an appropriate response.

Security: "Never permit hostile factions to acquire an unexpected advantage."[23] Units must be ready to counter any activity to bring harm to them or jeopardize their mission. Inherent in this responsibility is the need to be capable of rapid transition from a peaceful to a combat posture. A versatile, flexible force will be better at applying the principle of security.

The principles of OOTW outlined above, have a recurring theme—versatility. And indeed, the Army has added versatility as a tenet of Army operations. According to FM 100-5, "versatility is the ability of

units to meet diverse mission requirements.… It implies a capacity to be multi-functional, to operate across the full range of military operations, and to perform at the tactical, operational, and strategic levels.…Versatility denotes the ability to perform in many roles and environments during war and OOTW.…It requires competence in a variety of missions and skills."[24] Versatility is a blanket that covers all OOTW principles. A unit that can create this blanket has a much better chance of success in OOTW.

For engineers especially, OOTW operations call for a merging of engineer missions of mobility, countermobility, survivability, and sustainment. OOTW operations often require the merging of force protection, force sustainment, nation assistance, and disaster relief operations. While it is the norm to distribute these functions between different units in high intensity combat operations, a single unit may have to perform the whole spectrum in OOTW. As has been outlined in our doctrine, this requires a flexible, versatile, and capable organization, one that is structured to perform well across the operational spectrum. This will be validated further by looking at historical OOTW cases.

SECTION III - HISTORICAL ANALYSIS

> **Army forces have participated in OOTW in support of national interests throughout its history. They have protected citizens at the edge of the frontiers of an expanding America; built roads, bridges, and canals; assisted nations abroad; and served our nation in a variety of other missions.**
>
> **FM 100-5: Operations**[25]

Operations other than war are currently at the forefront of operational planning, but they have always been a part of the U.S. Army's operations. Throughout our history, the U.S. Army, and especially the Corps of Engineers, has participated in missions that helped develop our nation, as well as numerous other countries throughout the world. Many of these missions were of the nation assistance type in which the Corps' expertise was used to develop a nation's infrastructure. Others involved U.S. intervention and stability operations similar to the U. S. Army's recent missions in Somalia, Rwanda, and Haiti.

The historical analysis will examine three OOTW contingencies. The first is the U.S. intervention in Lebanon in 1958, the second is the U.S. intervention in the Dominican Republic in 1965, and the third is the British Army's deployment to Bosnia-Herzegovina in 1992-92 as part of UNPROFOR.

Interventions in Lebanon and the Dominican Republic were chosen because they are very similar to recent Army operations. These two examples, even though they were seven years apart, have many similarities. Both were executed on very short notice with a hastily assembled force. Both operations were of short duration and both were successful. In both cases, what was to be a potentially forceful entry, followed by combat operations, was changed to a permissive entry, followed by stability operations. And in both, engineers quickly found themselves concerned with force protection, humanitarian assistance and support to host nation authorities.

The British deployment to Bosnia-Herzegovina is examined, because it is a textbook example of a contemporary OOTW operation. It is relevant because we will be involved in this type of mission in the future, even if we do not participate as part of a U.N. force. The Bosnia-Herzegovina operation also illustrates the missions and capabilities of the Royal Engineer field squadron. These three historical cases validate our doctrine and provide lessons about the engineer force structure, size, capabilities.

Case I: Lebanon, 1958

In 1957, Congress approved the Eisenhower Doctrine, which was essentially a geographical and diplomatic

extension of the older Truman Doctrine. Like its predecessor, this new doctrine offered military and economic assistance to nations believed to be in danger from Communist-sponsored invasion or subversion. As part of the Eisenhower Doctrine, the U.S. offered aid to Middle East countries to counteract Soviet influence. Because of the U.S.'s association with the Middle East's former European colonists, that aid was turned down by everyone except the Republic of Lebanon.[26]

In 1958, the United States perceived that it faced a major crisis in the Middle East. The region was being swept by Arab nationalism and the U.S. and its European allies found themselves in disfavor in the region.[27] As a result of this anti-Western hostility, the U.S. cut off aid to Egypt. The Egyptian response was to shift its international allegiance to the Soviet Union.

With Egypt accepting Soviet aid, and other countries in the Middle East in the grip of nationalism, Lebanon emerged as a likely candidate for Communist subversion and for the overthrow of its pro-Western government. Lebanon, at this time, was an independent country with a government combining diverse sectarian interests. Under such circumstances it was having serious problems weathering the turbulent regional politics.

The Beirut government was in a crisis as a direct result of its agreement to accept the Eisenhower

administration's support. Further, it was an election year, and the incumbent government was faced with a new opposition party as well as a popular ground swell calling for elimination of western influence in the region.

The neutral player in this situation was the Lebanese Army. The Army's Officer Corps was heavily Christian, but the ranks were proportional to the country's ethnic population. Their neutrality would be the key factor that allowed the U.S. forces a permissive entry into Lebanon.

Meanwhile, in January of 1956, the U.S. Army Continental Command was directed to create a family of war plans for contingency interventions in the Middle East. The plans were intended to prevent an outbreak of war by interposing American troops between possible belligerents. Critically, the plans also assumed that one of the perspective belligerents would permit entry and operations of U.S. military forces.[28]

The American Land Forces (AMLANFOR), consisted of the headquarters element, the 24th Airborne Brigade, a force from the 2nd Marine Division, the 201st Logistical Command, and the Adana Subcommand. Engineers assigned to the force included Company E, 3rd Engineer Battalion, the 299th Engineer Battalion (Construction) (Combat), 79th Engineer Battalion (Construction). These units provided support in three categories: combat

engineering, combat construction, and construction. The combat construction, and construction engineer units performed missions which are performed today by combat heavy engineer units.

The missions assigned to the deployed engineers included digging in and maintenance and repair of equipment, roads, railroads and buildings.[29] The engineer force deployed to Lebanon had the luxury of being specifically tailored for each assigned mission. Because of the sheer variety and quantities of engineer equipment and skills available to the commander, the engineers executed all missions without difficulties. The price for this capability was a cumbersome and overwhelming engineer force. Major General David W. Gray, AMLANFOR commander, recalled:

> "I believe we did err in one respect. Instead of a construction battalion we should have had a provisional company specially tailored to meet our specific needs. Truthfully, I was flabbergasted as I watched the parade of heavy equipment, rock crushers, steamrollers, asphalt dispensers, cranes, you name it, that rolled off ship in a seemingly endless stream. Under the circumstances, we didn't need it and had difficulty finding a place to park it. Of course, if we had stayed through the rainy season, more permanent installations would have been necessary and the construction battalion would have gotten a workout, but even so I believe our engineer combat battalion plus a provisional construction company and our airborne engineer company augmented by local labor would have been adequate."[30]

Major General Gray's comment illustrates an improperly tailored force for the mission at hand. The excessively large engineer contingent unnecessarily exposed additional American soldiers to a potential threat and took resources away from other units and missions. Today, as a leaner force projection army, we may not be able to afford the same level of mission specific forces. Force size is also directly related to a contingency response time.

Today, response times to crises must be faster. At the same time, there is an expectation to complete the mission as quickly as possible with no U.S. casualties. These two considerations apply today. We face constrained resources and an increased public sensitivity to American casualties in situations where our national interest is not perceived to be in jeopardy. Because of this, a smaller force will always be preferable for OOTW.

So what have we learned from Lebanon that is relevant to today's engineer force structure? All forces deployed must be as streamlined as possible. They must be capable of performing a wide variety of missions—they must be versatile. Engineers in particular must be integrated into the operation from the beginning to enable the commander to properly structure and use his engineer assets.

The U.S. Army did not restructure combat engineers as a result of the Lebanon experience.[31] The U.S. Army continued to focus on the threat posed by the Soviet Union. Consequently U.S. Forces were justifiably tailored to meet this threat. Seven years later, similar problems would surface again as the United States intervened in the Dominican Republic crises.

Case II: The Dominican Republic, 1965

In 1965, the United States perceived that it was facing the prospect of another Cuba in the Dominican Republic.[32] Consequently, in April of that year, President Johnson ordered American troops into the Dominican Republic. The force was to consist of the 82nd Airborne Division and the four Marine battalion landing teams of the 4th Marine Expeditionary Brigade, together with other special and supporting units.[33] After the completion of the initial stability operation, the American soldiers were to assume a peacekeeping role.

The engineers' mission initially was one of traditional combat support. They were to assist the combat units with their forced entry, opening up the lines of communication into Santo Domingo from the airfield, and establishing an isolation zone around the rebel forces. As the initial entry into the Dominican Republic was unopposed and subsequent resistance negligible, the engineer mission shifted to the classic

OOTW tasks of supporting the civic action programs of the U.S. peacekeeping force.

> "To a degree unparalleled in U.S. military history, paratroopers and Marines in Santa Domingo found their actions governed by a plethora of politically and militarily motivated directives, guidelines, and rules of engagement. In general, these proclamations dictated that the combat operations would be defensive in nature, and that soldiers would engage in a variety of activities normally performed by civilian agencies and officials."[34]

The engineers in particular were required to provide critical services such as restoring power and water to Santo Domingo and repairing the city's incinerator.[35] The engineers were not prepared to perform these tasks.

> "For the most part, the division's engineers lacked the equipment and skills to repair and operate large facilities such as waterworks, incinerators, and power plants, but with the assistance of civilian and military experts, they managed to put the plants into operation."[36]

The engineers also performed more traditional tasks like emplacing booby traps that included mines, grenades, barbed wire, and trip flares in the Santo Domingo sewers to prevent their being used by the guerrillas. They also assisted in manning checkpoints where they assisted with searches of the civilian population by using mine detectors to search for hidden weapons.[37]

The engineers deployed to the Dominican Republic comprised a much smaller force than that which deployed to Lebanon, yet they were faced with the much more difficult task of restoring Santo Domingo's partially crippled infrastructure. The combat engineers deployed with the 82nd Airborne Division did not have the equipment, nor the necessary skills for some of the tasks which confronted them. They were able to overcome these problems by drawing on the local population's expertise. While this is certainly an acceptable option for all OOTW, it may not always be feasible in third world countries which have been torn apart by internal strife or from which such expertise has fled.

The lessons of the Dominican Republic intervention highlight and reinforce the lessons of Lebanon. They are:

1. Engineers deployed on OOTW missions will face the full continuum of operations, from combat, to stability and nation building.

2. Engineers must be properly manned with skilled personnel and equipped with a variety of equipment that will allow them to accomplish a wide variety of missions.

3. Host nation resources and expertise can be effectively used if available in country.

4. Engineer missions have an impact from the tactical to the strategic level of the operation and are

effective in legitimizing and building support for U.S. intervention.

In contrast to the U.S. operations in the Dominican Republic, the British Army's OOTW expertise allowed it to approach its deployment to Bosnia-Herzegovina with a full understanding of the required engineer capabilities.

Case III: Bosnia-Herzegovina, 1992-93

On August 25, 1992, 35 Royal Engineer Regiment was alerted for deployment to the former Yugoslavia as part of British Forces (BRITFOR) taking part in the newly established UNPROFOR. BRITFOR's mission was to participate in a U.N. multinational peacekeeping operations in Bosnia-Herzegovina; specifically, they were to establish a supply corridor from the Dalmatian port of Split to the besieged capitol Sarajevo, to maintain this corridor, and to provide protection to the U.N. and other humanitarian organizations' relief convoys.

The engineers had a major role in the execution of this mission. They were charged with establishing the lodgment facilities for the British forces and were to recon the potential routes to Sarajevo. In addition, they were to establish a forward operating base in the town of Vitez and two main supply route (MSR) maintenance equipment sites/rest areas. An integral part

of this mission was the provision of force protection to the deployed forces, along with the traditional tasks of clearing minefields and booby traps which were abundant in the area of operations.

In analyzing the BRITFOR mission, Lieutenant Colonel (Lt Col) John Field, RE, OBE (Order of the British Empire), commander of 35 Royal Engineer Regiment, immediately understood that the British engineers would have to perform a wide variety of engineer tasks, simultaneously, over extended distances. He argued for and received permission to deploy the majority of the Regiment; an engineer force some planners felt was too large in proportion to the combat elements. Ultimately, Lt Col Field's estimate proved correct.

BRITFOR deployed with minor augmentations to their engineers. They were an Explosive Ordinance Disposal (EOD) team and a Support Team Royal Engineers (STRE) team, along with various additional pieces of heavy equipment from the United Kingdom.[38] These attachments provided 35 Engineer Regiment with the ability to deal with the belligerents' mine and unexploded ordinance threat, the capability to perform facility design, and an enhanced construction capability.

Once deployed to former Yugoslavia, the regiment found itself dispersed from the port of Split in Croatia to Sarajevo, in Bosnia-Herzegovina. The Regimental

Headquarters was co-located with BRITFOR Headquarters in Split. The headquarters squadron and the two field squadrons were dispersed throughout the British zone of operation.

44 Headquarters (HQ) Squadron and 37 Field Squadron were forward deployed in Tomislavgrad. From there, the squadron could provide MSR maintenance, south to Split and north to Vitez. 44 HQ Squadron was tasked with the bulk of MSR maintenance and with providing equipment support to the field squadrons. 37 Field Squadron was charged with setting up the facilities for all British forces in Tomislavgrad, and bridge and route maintenance.

42 Field Squadron was the most forward based squadron. It was co-located with a British infantry regiment in Vitez. Their mission was to maintain the MSR south towards Tomislavgrad and north to Sarajevo. In addition, they constructed a forward operating base which included construction of prefabricated housing units, office and maintenance facilities, survivability positions, and force protection measure.[39]

The engineers were faced with "mission creep" from the moment they arrived in theater. The unexpected demands on the engineers ranged from goodwill and public relations projects, such as the repair of orphanages, school playgrounds, and power and water distribution to local communities; to providing engineer support to

other UNPROFOR troops. The latter included construction of Bailey bridges across destroyed highway bridges on the main highway from Sarajevo to Split, and conducting reconnaissance throughout Bosnia-Herzegovina for UNPROFOR Headquarters located in Sarajevo.

All of these missions were successfully executed by the field squadrons. Because of their unique organization, the squadrons were able to perform these tasks with only equipment support from 44 Headquarters Squadron and technical advice from the EOD and STRE teams. Significantly, the British force suffered only one belligerent-related casualty—an APC driver was shot by an unknown sniper.

The three case histories collectively show that contemporary OOTW demand not only flexible forces with a wide range of infrastructure skills, but that these qualities have been requirements for over thirty years. Now that the doctrine and the historical case studies have been examined, the two engineer organizations will be detailed. What sort of organizational model offers the best combination of capabilities?

SECTION IV - THE TWO ORGANIZATIONS

> **[The] trend will continue toward MOS refocusing or consolidation…require individual soldiers to function in a broader variety of roles.**
>
> **Engineer 2000 White Paper**[40]

A detailed examination of the American and British engineer company organizations will first look at the structure, equipment, and manpower of each unit. Second, it will analyze how these translate into capabilities that tie in to OOTW requirements outlined in our doctrine and the historical case studies. The U.S. Army combat engineer company is evaluated first, followed by the British Army's Royal Engineer Squadron.

The U.S. Army Combat Engineer Company (Mechanized)

(Figure 1)

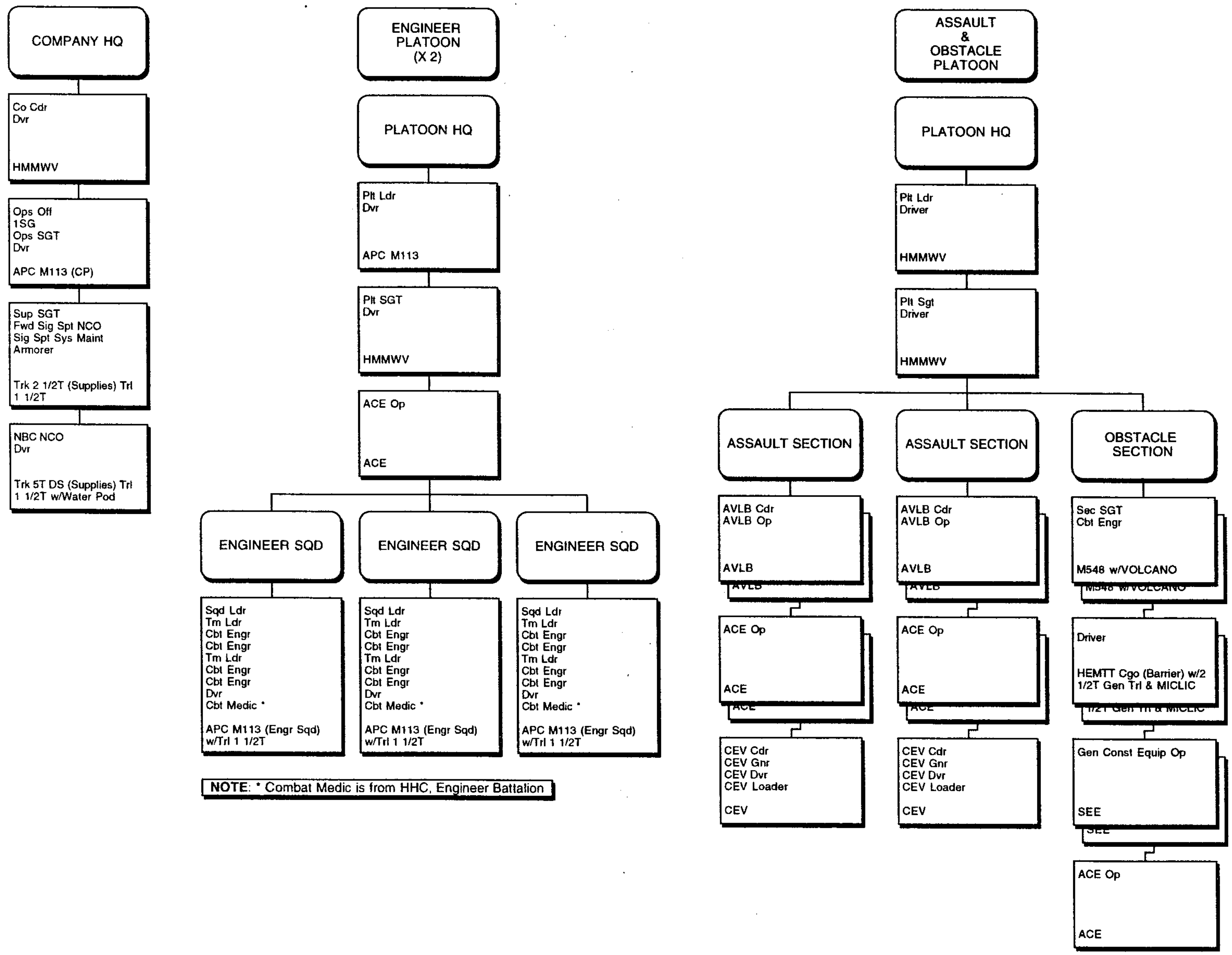
A U.S. Army divisional combat engineer company is comprised of company headquarters, two line platoons, and an assault and obstacle platoon. The company has five officers and ninety-seven enlisted soldiers. Its mission is to increase the combat effectiveness of the engineer battalion by accomplishing mobility, counter mobility, and limited survivability tasks; and by fighting as infantry when required. Under its operations and functions, each of the six engineer squads is also tasked with providing sustainment engineering.[41]

The company is commanded by a captain. The commander is assisted by a lieutenant who serves as the Executive Officer (XO) and as the Operations Officer, the First Sergeant, an Operations Sergeant, an Nuclear, Biological and Chemical (NBC) warfare non-commissioned officer (NCO), a Supply Sergeant, an Armorer, and the

Signal Support Systems Maintainer. Each of the company's three platoons is commanded by a lieutenant who is assisted by a platoon sergeant.

The company's primary equipment is the M113 Armored Personnel Carrier (APC). In addition, the assault and obstacle platoon contains the armored vehicles required for assault breaches. This comprises combat engineer vehicles(CEV), armored vehicle launched bridges(AVLB), armored combat earthmovers (ACE), and Volcano mine dispensing systems. The two assault sections provide the AVLBs and a CEV for mobility and countermobility support. The obstacle section also provides equipment and material to support mobility and countermobility tasks. It does this through the use of the Volcano scatterable mine system, the Small Emplacement Excavator (SEE), and the ACE, and The Heavy Expanded Mobility Tactical Truck (HEMTT).

The combat engineer company is a lean, combat focused organization. It does not have the versatility, command and control, nor the support capability required for OOTW. The company is very dependent on its parent headquarters_the engineer battalion—for its sustainment. This organization is in many respects even less capable than those engineer organizations deployed to Lebanon and the Dominican Republic.[42]



NOTE: * Combat Medic is from HHC, Engineer Battalion

FIGURE 1 - THE U.S. ARMY COMBAT ENGINEER COMPANY (MECHANIZED)

The Royal Engineer Field Squadron (Figure 2)

For a contrast of how a different country approaches the structure of its engineer force, we will now look at the Royal Engineer Field Squadron. The British engineer regiment is organized into four squadrons; three field squadrons and one headquarters squadron. The three field squadrons are combat engineer company equivalents without the U.S. engineer companies' armored assets. The headquarters squadron comprises the regimental headquarters element, with its command group and staff sections, and the regiment's support element. The headquarters squadron contains the majority of the heavy and specialized equipment required by the regiment.

The field squadron is comprised of six elements: a headquarters section, three line troops, a support troop, and an echelon. Unlike American engineer companies, the squadron is commanded by Major and has a more robust command and control structure. The squadron officer commanding (OC) has at his disposal a Second-In-Command (2IC), an operations officer, an administrative officer, three troop commanders, and a squadron sergeant major. All officers, except the troop commanders, are usually captains, with the administrative officer being a commissioned former Warrant Officer.

The squadron headquarters contains all the elements necessary for the command and control of the squadron.

The officer commanding has at his disposal two command vehicles (CVs): CV1 and CV2. They are equivalent to a U.S. Army's (Tactical Command Post) and a Tactical Operations Center (TOC). The operations officer has at his disposal an engineer reconnaissance sergeant, a signals NCO, and a dispatch rider (DR). The OC also has at his disposal a Spartan Reconnaissance Vehicle which is used as a Hard Rover.[1] There is also a FV432 Re-broadcasting Vehicle which is used to extend the command and control span of the squadron.

Each field troop is comprised of a troop headquarters and four field sections. The troop commander and the troop staff sergeant are located in the troop headquarters. The field sections are commanded by a section sergeant and have a number of sappers and engineer tradesmen. They are equipped with a FV432 APC. Two of the FV432s in a troop carry a Ranger Scatterable Mine System and one pulls a Bar Minelayer.[2] The sections are also equipped with the appropriate tradesmen's tool kits.

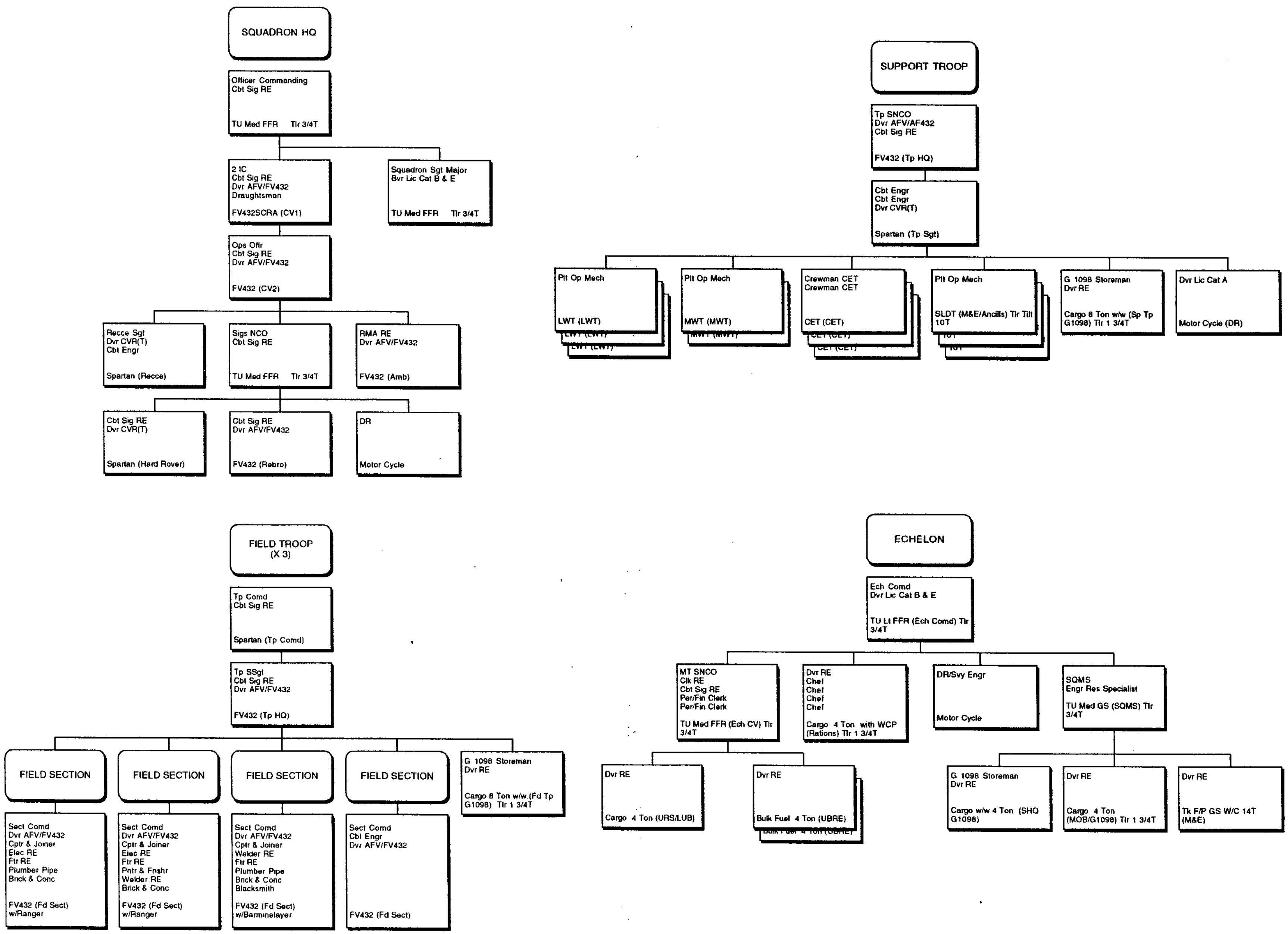
The field squadron support troop is the equivalent of the U.S. Assault and Obstacle Platoon. It is commanded by a troop staff sergeant and consists of light wheel tractors(LWT), medium wheel tractors (MWT), combat engineer tractors (CET), and three 10 ton dump trucks with tilt trailers, a cargo truck and a dispatch rider. Since it does not have AVLBs and CEVs, the

squadron support troop does not have assault breaching capability.

The British squadron has its own organic maintenance, supply, mess, communications, and equipment sections. They are located in the squadron echelons. The squadron echelon provides the administrative and logistical support to the squadron. It is commanded by the squadron administrative officer. The echelon consists of the squadron maintenance section, the mess section, and the squadron supply section. The echelon provides the squadron with vehicle repair, repair parts, bulk fuel, supplies, and personnel, admin, and finance action support.

In summary, the engineer field squadron is a much more robust organization. It nicely dovetails with our doctrinal OOTW principles and tenets. This organization meets the requirements of versatility, flexibility, and capability. As can be seen, it has the skills and equipment necessary to accomplish a wide variety of missions. This organization could have accomplished the mission in Lebanon and the Dominican Republic as well as it has in former Yugoslavia.

Now that the two organizations have been examined, they will be compared, contrasted and evaluated for strengths and weaknesses that would be beneficial or detrimental to OOTW. Specifically, they will be evaluated for versatility, size, and capability; the key



APPENDIX 2 - THE ROYAL ENGINEER FIELD SQUADRON

criteria deduced from doctrine and historical case studies.

SECTION V - COMPARISON

The Army will be smaller, it must remain versatile, deployable, and lethal, [while it is] more capable with contingency, reinforcing, and nation assistance forces.

Engineer 2000 White Paper[1]

After comparing the British engineer field squadron and an American combat engineer company, the British field squadron offers a broader package of capabilities, much more appropriate for OOTW. At the same time, it is extremely capable of performing in high intensity conflict. The field squadron's strengths are in its more robust and distributed command and control with its inherent ability to conduct dispersed operations, its depth of civilian skill expertise, its array of available construction equipment, and its organic support capability. To some extent, these strengths are attributable to the deeper British commitment to OOTW.

The British engineer field squadron is a much more robust organization in terms of numbers and experience levels of its personnel. First, starting with the commander, the squadron OC is more senior and more experienced than the average U.S. company commander. The squadron OC is a graduate of the British Army's Staff College, and therefore has a higher military educational

level. Under him, he has not only a larger staff, but, on average, a more senior one as well.

The second key difference between the U.S. and British company headquarters is the availability of a 2IC and an operations officer. The 2IC manages the squadron's daily operations. He oversees the squadron's maintenance, supply, and administration. In the field he controls squadron operations and resources. He is in essence, the equivalent of a battalion Executive Officer (XO), but at the squadron level. The operation officer is responsible for developing and monitoring the squadron's training program, obtaining and allocating training resources, and coordinating operations with the regimental headquarters. He is, in essence, the equivalent of a battalion S-3, but at the squadron level. In the field, he is responsible for the squadron's command post (CP) operations and production of operations orders. The duties of these two individuals are performed by one First Lieutenant in the U.S. engineer company.

The third major difference is the administrative officer billet. This captain is normally a former Warrant Officer who has been commissioned from the ranks. He is an expert in administration, responsible for the personnel administration of the squadron's soldiers. He is the battalion S-1 equivalent, but again at the squadron level. The administrative officer is

involved in all aspects of soldiers' welfare, from indebtedness counseling and career counseling; to coordination with the Regimental Staff Assistant[2] on the military education and career progression of the soldiers in the squadron. Because the administrative officer is commissioned from the ranks, he has the benefit of knowledge and experience of twenty years of enlisted service. This special officer is selected from eligible senior warrant officers, through an army wide competitive selection process. As a result, these officers are highly competent, professional, and bring a wealth of experience to their position.

These first three differences: the robust, senior staff, with the 2IC, the operation officer, and the administration officer, free the squadron commander to focus on the command of the squadron and provide him with the ability to strengthen the principles of OOTW. That is to say, the commander can be at the point of main effort and can ensure that all squadron actions contribute to the accomplishment of a clearly defined objective unity of effort, legitimacy, restraint, and security.

A fourth area of contrast is overall manning. The British engineer field squadron is composed of approximately 160[3] men. This is a substantially more robust manpower organization than the current U.S. combat engineer company's 102[4]. More importantly, the

squadron has three troops compared to a company's two platoons, and each of the troops has 33[5] soldiers, compared to 29[6] in a U.S. engineer platoon.

The fifth major difference, which is more important than the difference in overall numbers, is the level of individual soldier's skills--a level that allows them to perform a wide spectrum of engineer and infrastructure support missions. Most of the soldiers in a field squadron have a secondary skill in one of the numerous artisan trades. These trades are engineer-related and vary from welding, and carpentry, to blacksmithing and masonry. Because these soldiers are highly trained in these skills, from apprentice to journeyman level, they confer a particular advantage in performing skilled construction and labor intensive engineer tasks--tasks common in OOTW.

Since none of these soldiers are involved with the assault armored engineer vehicles, they have only a limited capability to conduct mounted assault breaches. The combat engineer company's armored engineer equipment provides it with a clear advantage over its British counterpart in conducting breaching operations. Since this mission is less likely in OOTW, this function might be better consolidated at battalion level and task-organized as required, on a mission-by-mission basis.

Ironically, the British squadron headquarters is a more survivable and flexible organization because of its

equipment -- normally an American forte. The squadron OC has an armored vehicle available to him which allows him to move forward to the unit's main point of effort in a comparative safety. The squadron's command and control capabilities are much more robust and survivable as well. The availability of two command and control vehicles, as well as a re-broadcast vehicle, makes the squadron headquarters more survivable through redundancy and ability to disperse. It also allows the squadron a greater span of control. The usefulness of these assets and their contribution to force protection and operations, in the dispersed OOTW environment, is obvious.

The British squadron's field troops and the U.S. engineer platoons are most similar in terms of equipment. They are both equipped with armored personnel carriers as the basic squad vehicle. The difference is in the number of armored vehicles is slight; five for a field troop and four for an engineer platoon. The field troop also has an eight ton cargo truck that is used to move the troop's equipment and engineer material when required, while the engineer platoon has an ACE available to provide survivability and mobility support. The field troop's lack of an ACE is rectified by receiving engineer equipment support from the squadron support troop, on a mission basis.

Another major difference between the two organizations is in the equipment of the assault and obstacle platoon, the support troop, and the squadron's echelon. Here, the combat engineer company has an advantage due to the availability of armored engineer vehicles. With its four AVLBs, two CEVs, and four ACEs, the assault and obstacle platoon is clearly more capable of providing mobility support through enemy fortifications. On the other hand, the support troop has a much wider assortment of engineer equipment that is more suitable for sustainment engineering and support of OOTW. In addition, the echelon provides the squadron with the ability to be a self-sustaining organization.

The echelon allows the field squadron to operate autonomously in direct support of maneuver forces. This can be a major benefit in OOTW where operational units are deployed in clusters or operational areas, rather than in the traditional linear formations.

Finally, the U.S. model reveals its age in its focus on heavy breaching and mobility, a focus conceived and solidified facing Soviet formations in Central Europe. The more contemporary British model demonstrates a more flexible response to present contingencies. As we look at OOTW, from no combat to a potential of high intensity combat, it is clear that the British field squadron is much better suited to support.

The field squadron lacks in one regard only: the lack of armored engineer vehicles for assault breaching operations. If we look at OOTW and the potential adversaries we may face, this requirement is greatly reduced. On the other hand, it has everything to offer for every other type of engineer OOTW. It has the manpower with skills and the equipment that allow it to be versatile. It has a robust command and control structure with leadership that is senior, experienced, and trained to make difficult decisions which often surface in OOTW. Finally, it is an organization which can operate autonomously in a non-linear fashion, and can therefore accomplish a range of missions-missions that will have impact at all levels, from tactical to strategic, and throughout the theater of operations.

SECTION VI - CONCLUSIONS

> **"It (the successful and pioneering tour as part of UNPROFOR in Bosnia-Herzegovina) has proved once again how important it is for the sappers to maintain artisan and construction skills and has signified a marked change in role from the Cold War for engineers based in Germany. Everyone has learnt a great deal and the experiences gained by all our tradesmen will prove invaluable in the future."**
>
> **Lt Col John Durand, RE, OBE**[7]

This monograph set out to answer the question: Is there a better engineer company organization for OOTW?

It began by looking at the events that changed the U.S. Army's outlook towards operations. While the Army's basic purpose is to win our nation's wars, the changes in the perceived threat have formally added OOTW to our doctrine. The transition has been dramatic.

By examining our current doctrine, and specifically looking at OOTW principles and operational tenets, a clear pattern emerges. Our doctrine reveals a common thread which runs throughout OOTW principles of objective, unity of effort, legitimacy, perseverance, restraint, and security. This common thread is the Army's new operational tenet: versatility. Versatility is the key to success in OOTW. After identifying relevant doctrine, historical OOTW cases were used to validate the doctrine and draw lessons about engineer unit organizations and their effectiveness.

The U.S. intervention in Lebanon and the Dominican Republic, and the British participation in UNPROFOR provide a historical look at OOTW. These three operations, over more than three decades, provide a basis for looking at OOTW from more than one perspective. They allow us to look at OOTW over a period of time as well as from different national perspectives.

The two American historical case studies revealed units that were improperly structured for OOTW. They were either too large or too small and were not properly resourced for the wide variety of missions that OOTW

present. These were contrasted by the British experience in Bosnia-Herzegovina where a balanced engineer unit was able to perform a wide array of engineer missions.

This analysis confirmed the validity of our doctrine. It also highlighted the critical qualities an engineer organization must have to be successful in OOTW. These critical qualities are versatility and flexibility. In previous OOTW, U.S. Army engineers were able to overcome their organization's shortcomings and successfully support the mission.

From doctrine and case studies, the monograph evaluated the current U.S. and British mechanized combat engineer organizations against the established criteria. After enumerating each unit's organizational structure and capabilities, a detailed examination followed.

Finally, the two organizations were compared and contrasted to each other. The U.S. combat engineer company has a distinct advantage in its armored engineer capability. This capability allows it to perform rapid assault breaches. Contrasting that are the Royal Engineer field squadron's balanced capabilities.

The field squadron is a versatile, flexible, and capable organization that possesses the critical elements needed for OOTW. Its strength lies in a more robust structure, a senior chain of command, a wide variety of skilled personnel, and engineer equipment capable of a wide range of tasks.

The critical analysis of both organizations clearly points to the field squadron as the organization of choice for OOTW. This does not mean that this organization will be suitable for all OOTW. As always, mission analysis identifies the critical tasks and capabilities that engineers must bring to an operation. However, by starting with an organization like the field squadron, the changes required will be minimal. The field squadron organization is therefore the ideal building block from which to construct a versatile, flexible, and capable engineer force.

ENDNOTES

[1] U.S. Army Engineer Center White Paper. Engineer 2000, 1991. p 4.

[2] Rinaldo, Richard J., LTC U.S. Army (Retired). "The Army as Part of a Peace Dividend," Military Review, February 1993. p 45-46.

[3] Ibid, p 45.

[4] Ibid, p 46.

[5] The Btitish Army has reduced its force by approximately thirty percet, from approximately 160,000 soldiers to 110,000. They accomplished this by amalgamating, or combining , units of tha same type (two different infantry regiments combined into one regiment), establishing new Corps from separate "cap badges" (Postal Couriers which were a part of the Corps of Royal Engineers, the Catering Corps, and the Adjutant Corps were combined into the Adjutant General Corps), and realigning existing units and their afiliations in Germany and Great Britain.

[6] The U.S. Army Personnel Exchange Program (PEP) is an officer exchange program between the U.S. Army and other armies. Selected officers are assigned to participating country's army and serve as as would be expected from one of the host country's own officers.

[7] UNPROFOR is one of the United Nations' (UN) missions to former Yugoslavia. Its mission is to provide support to UN and non-govermental agencies in delivering food to war striken parts of Bosnia-Herzegovina.

[8] The British Army's long tradition of OOTW has instilled in its soldiers a deeper understanding of OOTW requirements.

[9] Organization for Battle (ORBAT) is used to denote the establishment tables for a particular unit.

[10] Adkins, Ronald A., LTC. Iron Sappers Lead The Way: The 16th Engineer Battalion's Support of 1st Armored Division in Southwest Asia, 1993. p 30.

[11] ERI was not fully implemented during Desert Shield/Storm. Corps Combat Engineer Battalions were attached to divisions in order to increase the number of supporting engineers. Desert Shield/Storm was used to validate the ERI concept.

[12] Glenn, LTC Russell. Proposal to Restructure Divisional Engineer Regiments. p 1.

[13] Reive, COL R.I., OBE, Options for Change: The New Royal Engineer Field Army ORBAT, 1991. p 3.

[14] FM 100-5: Operations, 1993. p 13-0.

[15] Ibid, p 13-0.

[16] Ibid, p 13-0 - 13-8.

[17] Ibid, p 13-0.

[18] Ibid, p 13-3.

[19] Ibid, p 13--4.

[20] Ibid, p 13-4.

[21] Ibid, p 13-4.

[22] Ibid, p 13-4.

[23] Ibid, p 13-4.

[24] Ibid, p 2-9.

[25] Ibid, p 13-0.

[26] Spiller, Roger J., "Not War But Like War": the American Intervention in Lebanon, 1981. p 2.

[27] Ibid, p 3.

[28] Ibid, p 6.

[29] Wade, Gary H., LTC, Rapid Deployment Logistics: Lebanon, 1958, 1984. p 66-67.

[30] Gray, David W., MG, U.S. Army (retired). The U.S. Intervention in Lebanon, 1958: A Commander's Reminiscence, 1984. p 49-50.

[31] When comparing the engineer TO&E from before and after our operations in Lebanon, there is no significant change in the force structure.

[32] Yates, Lawrence A., Power Pack: U.S. Intervention in the Dominican Republic, 1965-1966. 1988.p 1.

[33] Ibid, p 39.

[34] Ibid, p 119.

[35] Ibid, p 133.

[36] Ibid, p 133.

[37] Ibid, p 128.

[38] 35 Engineer Regiment was augmented with water purification units, bulldozers, snow clearing blades for bucket loaders, and soil compactors.

[39] The British Army's force protection experience was translated to Bosnia-Herzegovina. This included fencing screens, anti-rocket screens on buildings and guardposts, and prefabricated survivability positions.

[40] U.S. Army Engineer Center White Paper. Engineer 2000,1991. p 18.

[41] Op Grapple Engineer Sitreps Oct 92 - Apr 93.

[42] The current combat engineer company organization has lost much of the heavy engineer equipment and personnel that would have been available at the time of the Dominican Republic crisis.

[43] A hard rover is a reconnaissance APC that belongs to the squadron OC. It provides him with survivability when he moves forward to the squadron's point of main effort.

[44] An FV432 APC is functionally equivalent to the U.S. Army's M113. The Ranger's Scatterable Mine System is a anti-personnel mine system. It is used to "seed" the

anti-tank minefields which have been emplaced using the bar mine layer.

[45] U.S. Army Engineer Center White Paper. Engineer 2000, 1991. p 5.

[46] The Regimenal Staff Assistant is a personal assistant to the Regimental Commander. He, in conjunction with the Regimental Adjutant, provides advice to the commander on all enlisted personnel matters. This includes promotions, schooling, evaluation reports, and assignements.

[47] Organisation Table, Field Squadron (mech)(1 Div), Establishment Number 02/2933/01 (P)(W), 18 Mar 92, p 4.

[48] TOE Handbook 05330L-CTH, pg 172.

[49] Organisation Table, Field Squadron (mech)(1 Div), Establishment Number 02/2933/01 (P)(W), 18 Mar 92, p 1.

[50] TOE Handbook 05330L-CTH, pg 183-184.

[51] Op Grapple Engineer Sitreps Oct 92 - Apr 93.

BIBLIOGRAPHY

Adkins, Ronald A., LTC. Iron Sappers Lead The Way: The 16th Engineer Battalion's Support of 1st Armored Division in Southwest Asia, U.S. Army War College, Carlisle Barracks, Pennsylvania, 1993.

Anderson, J.D.C., COL RE, Command and Control at Battlegroup Level, 1993.

Department of the Army, FM 5-100: Engineer Combat Operations, Department of the Army, Washington, D.C.,1988.

Department of the Army, FM 5-114: Engineer Operation Short of War, Department of the Army, Washington, D.C.,1992.

Department of the Army, FM 100-5: Operations, Department of the Army, Washington, D.C.,1993.

Department of the Army, Armored Engineer Company, TOE Nr. 5-217R, Department of the Army, Washington, D.C.,1955.

Department of the Army, Engineer Battalion, Infantry Division, TOE No. 5-155E, Department of the Army, Washington, D.C.,1963.

Department of the Army, Engineer Company, Engineer Battalion, Infantry Division, TOE No. 5-157E, Department of the Army, Washington, D.C.,1963.

Department of the Army, Engineer Company, Engineer Battalion, Airborne Division, TOE No. 5-27F, Department of the Army, Washington, D.C.,1966.

Department of the Army, Commander's TOE Handbook Engineer Battalion Heavy Division, TOE Handbook 05145L-CTH, Department of the Army, Washington, D.C.,1989.

Department of the Army, Commander's TOE Handbook Engineer Battalion Division Engineer Brigade, TOE Handbook 05330L-CTH, Department of the Army, Washington, D.C.,1992.

Department of the Army, Commander's TOE Handbook Engineer Combat Battalion (Heavy), TOE Handbook 05415L-CTH, Department of the Army, Washington, D.C.,1992.

Glenn, Russell LTC U.S. Army, Proposal to Restructure Divisional Engineer Regiments

Gray, Major General David W., U.S. Army (retired), The U.S. Intervention in Lebanon, 1958: A Commander's Reminiscence, U.S. Army Command and General Staff College, Ft. Leavenworth, Kansas, 1984.

Greenberg, Lawrence M., MAJ, U.S. Army, United States Army Unilateral and Coalition Operations in the 1965 Dominican Republic Intervention, U.S. Army Center for Military History, Washington, D.C., 1987.

HQ 1 (BR) Corps, Option W Establishments, Bielefeld, Germany, 1992.

Ministry of Defence, Organisation Table, Field Squadron (mech)(1 Div), Establishment Number 02/2933/01 (P)(W), 18 March 1992.

Mohr, Jerry T., MAJ, U.S. Army, AirLand Battle Future: Combat Engineer Force Structure, U.S. Army Command and General Staff College, Ft. Leavenworth, Kansas, 1990.

Pierce, Kerry K., MAJ, U.S. Army, E-Force: How Agile is it?, U.S. Army Command and General Staff College, Ft. Leavenworth, Kansas, 1986.

Reive, COL RE, OBE, Options for Change: The New Royal Engineer Field Army ORBAT - Information Pack, London, England: Ministry of Defence, London, England, 1991.

Rinaldo, Richard J., LTC U.S. Army (Retired). "The Army as Part of a Peace Dividend," Military Review, Department of the Army, Command and General Staff College, Ft. Leavenworth, Kansas, February 1993, pp 45-54.

U.S. Army Engineer Center, Engineer 2000, U.S. Army Engineer Center, Fort Leonard Wood, Missouri, . 1991.

U.S. Army Engineer School, Engineer Operations Other Than War, U.S. Army Engineer Center, Fort Leonard Wood, Missouri, 1993.

Wade, Gary H., COL, U.S. Army, Rapid Deployment Logistics: Lebanon 1958, U.S. Army Command and General Staff College, Ft. Leavenworth, Kansas, 1984.

Yates, Lawrence A., Power Pack: U.S. Intervention in the Dominican Republic, 1965-1966, U.S. Army Command and General Staff College, Ft. Leavenworth, Kansas, 1988.